

AX5426P

PCI Card

32CH Opto-isolated D/I

32CH Opto-isolated D/O

User's Manual

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ESD Precautions

Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This helps to discharge any static electricity on your body.
- Wear a wrist-grounding strap, available from most electronic component stores, when handling boards and components.

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Unpacking

The AX5426P is packed in an anti-static bag. The PCI Bus board has components that are easily damaged by static electricity. Do not remove the anti-static wrapping until proper precautions have been taken. Safety instructions in front of this user's manual describe anti-static precautions and procedures.

Inventory and Inspection

After unpacking the PCI Bus board, place it on a raised surface and carefully inspect the board for any damage that might have occurred during shipment. Ground the board and exercise extreme care to prevent damage to the board from static electricity.

Integrated circuits will sometimes come out of their sockets during shipment. Examine all integrated circuits, to ensure that they are firmly seated.

The AX5426P PCI Bus interface DI/O Board package includes the following:

- AX5426P Board
- AX5003 Extension Board
- Flat cable 40p 45cm x 1
- AS59099 DAC Driver CD
- AX5426P(0) user's manual
- Warranty card

Make sure that all of the items listed above are present.

What To Do If There Is A Problem

If there are damaged or missing parts, contact your supplier and/or dealer immediately. Do not attempt to apply power to the board if there is damage to any of its components.

Table of Contents

Chapter 1 Introduction

1.1	General Description	1
1.2	Features.....	1
1.3	Specifications	2
1.3.1	Isolated Input	2
1.3.2	Isolated output	2
1.3.3	Power Consumption	2
1.3.4	Physical/Environmental	3
1.3.5	Application	3

Chapter 2 Board Configuration and Installation

2.1	Locator Diagram	5
2.2	Jumper Settings.....	6
2.2.1	JP2: IRQ Level Selection	6
2.2.2	JP1: Select Type of Trigger	6
2.2.3	Power Supply Selection	6
2.3	Connector Pin Assignments	7
2.4	Hardware Installation	9
2.4.1	Board Installation	9
2.4.2	AX5426P Extension Board Cable Connection	10
2.4.3	J1 Pin Assignment via ax5003 Extension Board.....	11
2.4.4	Connecting DAS Cards to AX851 Universal Screw Terminal Panel	12

Chapter 3 Register Format and Description

3.1	I/O Address Mapping	13
3.2	Register Description	14
3.2.1	Base address + 0XC0 (write)	14
3.2.2	Base address + 0XC4 (write)	14
3.2.3	Base address + 0XC8 (write)	14
3.2.4	Base address + 0XCC (write).....	14
3.2.5	Base address + 0XC0 (read)	14
3.2.6	Base address + 0XC4 (read)	14
3.2.7	Base address + 0XC8 (read)	14
3.2.8	Base address + OXCC (read)	15
3.2.9	Base address + 2 (write).....	15
3.2.10	Base address + 5	15
3.2.11	Base address + 7	15
3.2.12	Base address + 0x2a.....	15

3.3	Digital Input Circuit (with internal power supply).....	17
3.4	Digital Input Circuit (with external power supply).....	17
3.5	Digital Output Circuit.....	18
3.6	Interrupt Diagram.....	19
Chapter 4 Device Driver		
Chapter 5 Using the Device Driver Command		
Chapter 6 Examples		
6.1	Turbo C.....	23
6.2	Turbo PASCAL	24
6.3	Qbasic 4.5.....	25
Appendix A Block Diagram		

Chapter 1

Introduction

1.1 General Description

The AX5426P is a PCI-isolated DIO card providing 32 opto-isolated digital inputs and 32 opto-isolated open collector outputs. The board interface allows its plugging into any PCI slot of an IBM™ PC/AT or compatible computer with PCI bus. The opto-isolated digital inputs are suitable for monitoring device ON/OFF status and alarms or sensors with discrete outputs in noisy environments. The opto-isolated digital output channels are open-collector outputs.

Each output is capable of high-power current sinks up to 100mA for actuating external devices such as High Voltage/high current relay, switches, alarms, buzzers and LEDs.

The internal or external power of its digital inputs can be selected by jumper settings. An additional feature of the AX5426P digital outputs provides external power supply and usage from 5 to 24V_{DC}.

The AX5426P has one 37-pin D-sub connector and one 40-pin male connector. The 40-pin flat cable and AX5003 conversion board are used during case installation, the digital signal can through the second D-sub connector to 40-pin male connector.

1.2 Features

- 64 Isolated DIO channels (32 inputs and 32 outputs)
- High-voltage isolation on isolated I/O channels(3500vrms)
- Up to 24V outputs and 100 mA current sinks per channel
- External power supply voltage 5 to 24 VDC for digital Output channels
- External power (5 to 24VDC) or internal power selectable for digital inputs

- Internal or external power jumper selectable for isolated input channels
- 2 interrupt source (DI_0 and DI_16)
- Interrupt level selection is decided by PC post, but you may get it by 5426DRV.SYS

1.3 Specifications

(Typical at +25% and standard voltages, unless otherwise noted.)

1.3.1 Isolated Input

- Number of Channels: 32
- Opto-isolator: PC357
- Isolation: 3750vrms Channel to Channel & Channel-to-Ground.
- Input Range: 5 to 24VDC
- Input Impedance: 1.2K/1W
- Response Time: 1khz max

1.3.2 Isolated output

- Number of Channels: 32
- Opto-isolator: PC357
- Output Voltage: 5 to +24VDC / 100mA
- Isolation: 3750vrms Channel to Channel Channel-to-Ground.

1.3.3 Power Consumption

- +5V: 550mA
- DC to DC converter: Built-in

1.3.4 Physical/Environmental

- I/O Connector: 37-pin D-type male connector 40-pin male mating connector
- Dimensions: 185mm*115mm
- Weight: 150g
- Operating temp Range: -25oC to 70oC
- Relative Humidity: 0 to 90%, non-condensing

1.3.5 Application

- Industrial ON/OFF control
- BCD interface driver
- Relays and LEDs ON/OFF control
- Process control
- Signal switching
- Alarm Activating
- Limit switch monitoring
- Valve/Solenoid control

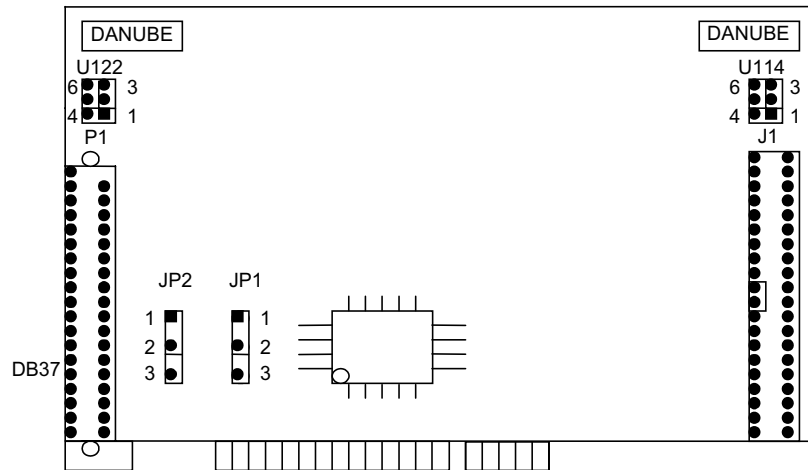
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Chapter 2

Board Configuration and Installation

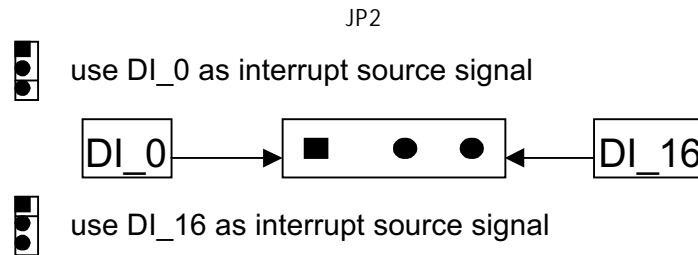
2.1 Locator Diagram

The following figure shows location of the AX5426P jumpers and connectors.

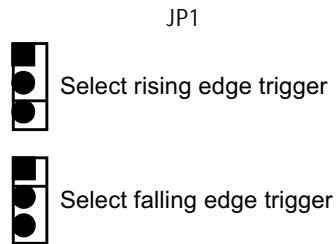


2.2 Jumper Settings


2.2.1 JP2: IRQ Level Selection




2.2.2 JP1: Select Type of Trigger




2.2.3 Power Supply Selection

 **U122**
1 select external power supply for DI_0~~DI_15

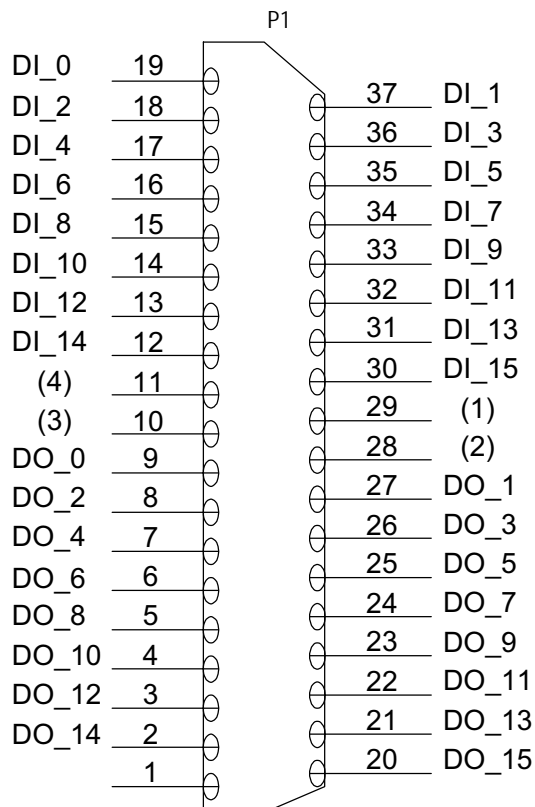
 **U122**
1 select internal power supply for DI_0~~DI_15

 **U114**
1 select external power supply for DI_16~~DI_31

 **U114**
1 select internal power supply for DI_16~~DI_31

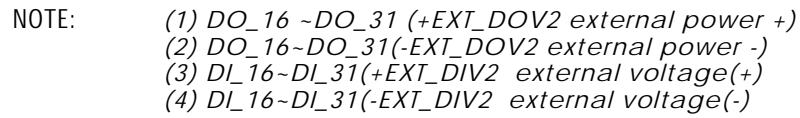
2.3 Connector Pin Assignments

All AX5426P board signals are built in one 37-pin D-sub male Connector (P1) and one 40-pin male mating connector (J1). The connector pin assignments are as following:



NOTE:

- (1) DO_0 ~DO_15 external voltage(+)
- (2) DO_0~DO_15 external voltage(-)
- (3) DI_0~DI_15 external voltage(+)
- (4) DI_0~DI_15 external voltage(-)



2.4 Hardware Installation

The AX5426P board is shipped with protective electrostatic cover. When unpacking, touch the board's electrostatically shielded packing with the metal frame of your computer to discharge the accumulated static electricity prior to touching the board.

The following section summarizes the procedures for installing AX5426P:

WARNING: *Turn OFF the PC and all accessories connected to the PC whenever installing or removing any peripheral board including the AX5426P board.*

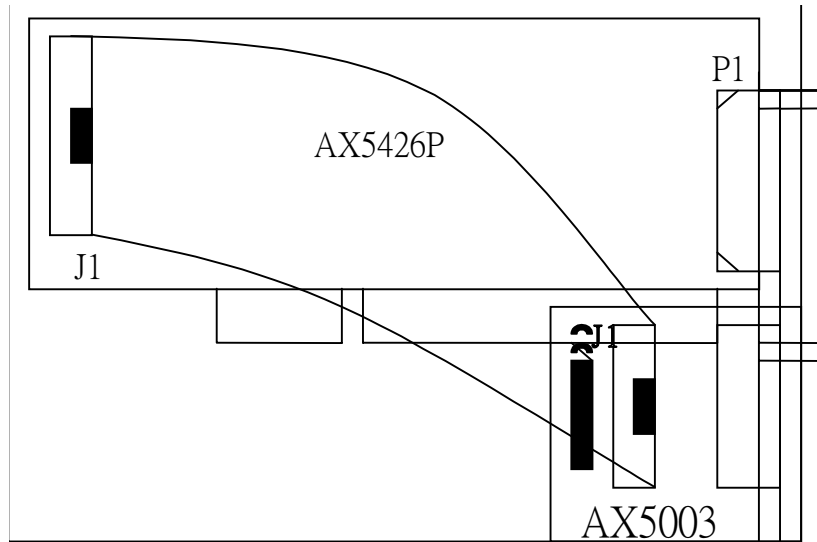
2.4.1 Board Installation

The following lists the instructions to following when installing the AX5426P card.

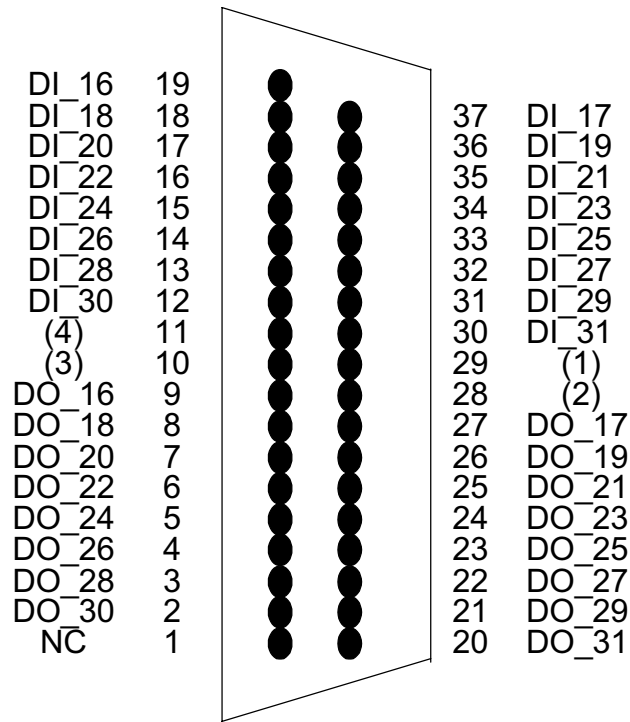
1. Turn OFF the PC and all accessories power.
2. Unplug all power cords and entire cables from the rear of the PC.
3. Remove the PC's cover (see your PC Operation Guide if you are not skillful about it).
4. Find an unused expansion slot. Remove the blank expansion slot cover and save the screw for affixing retaining bracket.
5. Grab the upper edge of the AX5426P board. Align the AX5426P board's retaining bracket with the expansion slot rear panel, and straighten the board's gold finger with the expansion slot. Gently push the board into slot.
6. Restore the screw to the expansion slot-retaining bracket.
7. Replace the PC's cover and connect the cables you detached in step2.
8. Turn ON the power of the PC and other peripheral device.

2.4.2 AX5426P Extension Board Cable Connection

Refer to the following illustration for the proper cable Connection from AX5426P card to the AX5003 extension board.



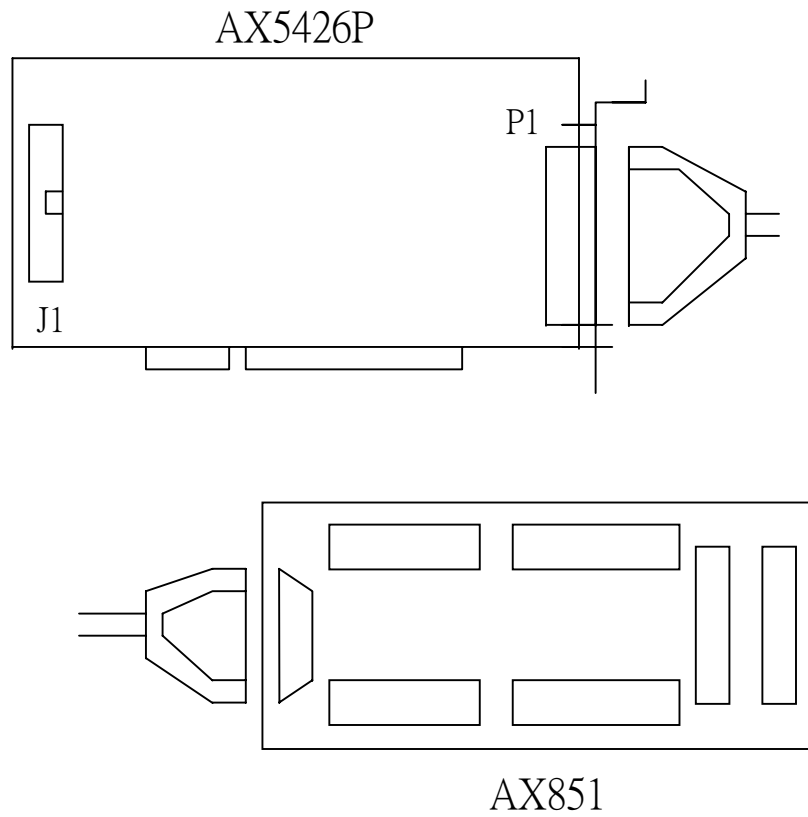
2.4.3 J1 Pin Assignment via ax5003 Extension Board



NOTE:

- (1) DO_16 ~DO_31 external voltage(+)
- (2) DO_16~DO_31 external voltage(-)
- (3) DI_16~DI_31 external voltage(+)
- (4) DI_16~DI_31 external voltage(-)

2.4.4 Connecting DAS Cards to AX851 Universal Screw Terminal Panel



C h a p t e r 3

Register Format and Description

3.1 I/O Address Mapping

The AX5426P use some non-consecutive addresses in I/O space. All Registers are 8 bits wide. The base address or starting address is determined during the installation by CPU auto setting. This chapter describes each register's format and functions.

Each register can be accessed easily by using direct I/O instructions of whatever application language available (Assembly, Basic, Pascal, C, etc.). An exception to the following includes I/O address. Don't operate any other I/O (below not listed I/O address), or else it will yield an error.

Location	Function	Type
Base Address +0xC0	Isolated output register for Channels 0 through 7	Write
Base Address +0xC4	Isolated output register for Channels 8 through 15	Write
Base Address +0xC8	Isolated output register for Channels 16 through 23	Write
Base Address +0xCC	Isolated output register for Channels 24 through 31	Write
Base Address+0xC0	Isolated input register for Channels 0 through 7	Read
Base Address +0xC4	Isolated input register for Channels 8 through 15	Read
Base Address +0xC8	Isolated input register for Channels 16 through 23	Read
Base Address +0xCC	Isolated input register for Channels 24 through 31	Read
Base Address+0xDC	Clear interrupt and Data don't care	Write

Location	Function	Type
Base Address +2	AUX1 pin control register Set 1 as an output Set 0 as an input	Write
Base Address +5	interrupt mask register	Write
Base Address +7	interrupt status register Read status of AUX	Read
Base Address +0X2a	AUX0 pin data polarity Control register. You must Set 1 to aux0	Write

3.2 Register Description

3.2.1 Base address + 0XC0 (write)

DO_7	DO_6	DO_5	DO_4	DO_3	DO_2	DO_1	DO_0
------	------	------	------	------	------	------	------

3.2.2 Base address + 0XC4 (write)

DO_15	DO_14	DO_13	DO_12	DO_11	DO_10	DO_9	DO_8
-------	-------	-------	-------	-------	-------	------	------

3.2.3 Base address + 0XC8 (write)

DO_23	DO_22	DO_21	DO_20	DO_19	DO_18	DO_17	DO_16
-------	-------	-------	-------	-------	-------	-------	-------

3.2.4 Base address + 0XCC (write)

DO_31	DO_30	DO_29	DO_28	DO_27	DO_26	DO_25	DO_24
-------	-------	-------	-------	-------	-------	-------	-------

3.2.5 Base address + 0XC0 (read)

DI_7	DI_6	DI_5	DI_4	DI_3	DI_2	DI_1	DI_0
------	------	------	------	------	------	------	------

3.2.6 Base address + 0XC4 (read)

DI_15	DI_14	DI_13	DI_12	DI_11	DI_10	DI_9	DI_8
-------	-------	-------	-------	-------	-------	------	------

3.2.7 Base address + 0XC8 (read)

DI_23	DI_22	DI_21	DI_20	DI_19	DI_18	DI_17	DI_16
-------	-------	-------	-------	-------	-------	-------	-------

3.2.8 Base address + OXCC (read)

DI_31	DI_30	DI_29	DI_28	DI_27	DI_26	DI_25	DI_24
-------	-------	-------	-------	-------	-------	-------	-------

3.2.9 Base address + 2 (write)

AUX7	AUX6	AUX5	AUX4	AUX3	AUX2	AUX1	AUX0
------	------	------	------	------	------	------	------

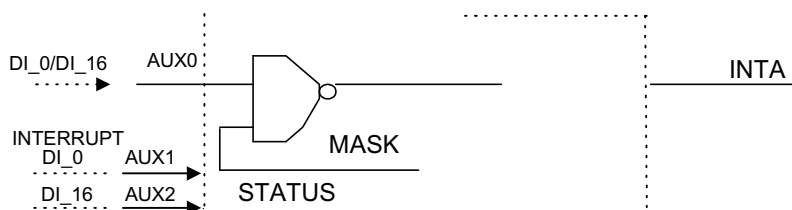
NOTE: *SET correspond to input line as input or output*
 Set 1 as an output
 Set 0 as an input, you must set "0" to aux0,aux1,aux2

3.2.10 Base address + 5

AUX7	AUX6	AUX5	AUX4	AUX3	AUX2	AUX1	AUX0
------	------	------	------	------	------	------	------

NOTE: *Masking corresponds to bit when input line creates*
 interrupt signal.
 Set 0 is masking
 Set 1 is unmasking.

Interrupt line is the first input line(DI_0) and the sixteenth line (DI_16). Rising or falling edge is available, but user can only select one of them. And AUX0 must be defined as input line/interrupt line (see next figure).aux1 and aux2 is status of DI_0 ,DI_16.



3.2.11 Base address + 7

AUX7	AUX6	AUX5	AUX4	AUX3	DI_16	DI_0	AUX0
------	------	------	------	------	-------	------	------

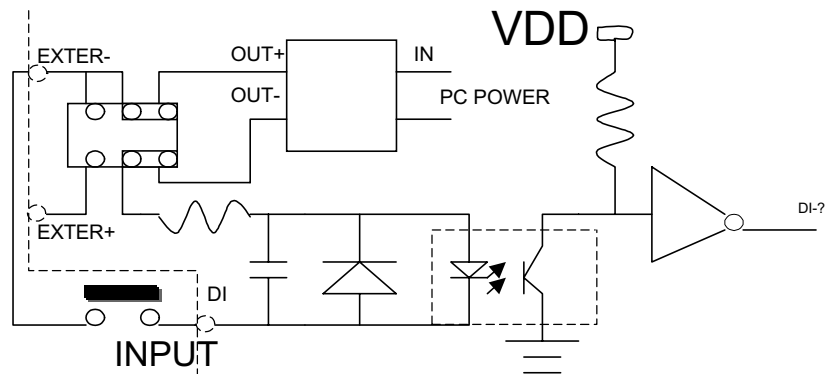
NOTE: *This byte is the status of AUX[7:0]. Aux0 is status of*
 interrupt signal

3.2.12 Base address + 0x2a

AUX7	AUX6	AUX5	AUX4	AUX3	AUX2	AUX1	AUX0
------	------	------	------	------	------	------	------

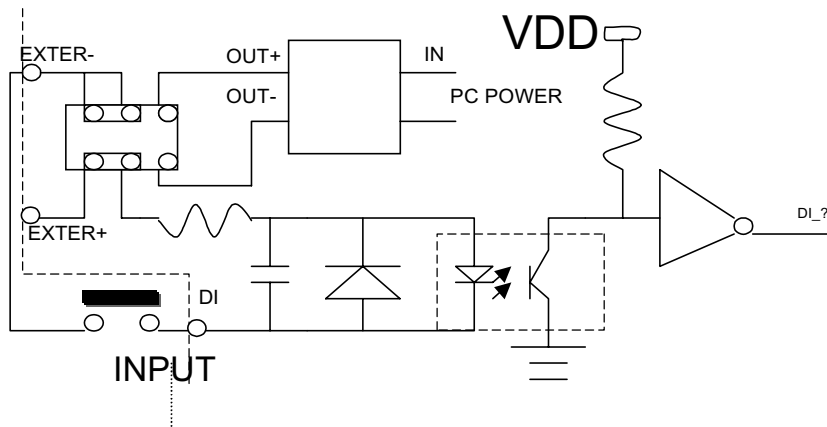
NOTE: *SET 1 to invert the polarity of AUX?
data.("0.1.2.3.4.5.6.7 will replaced "?"), YOU MUST SET
1 TO AUX0
This is very useful when using interrupt signal.*

3.3 Digital Input Circuit (with internal power supply)



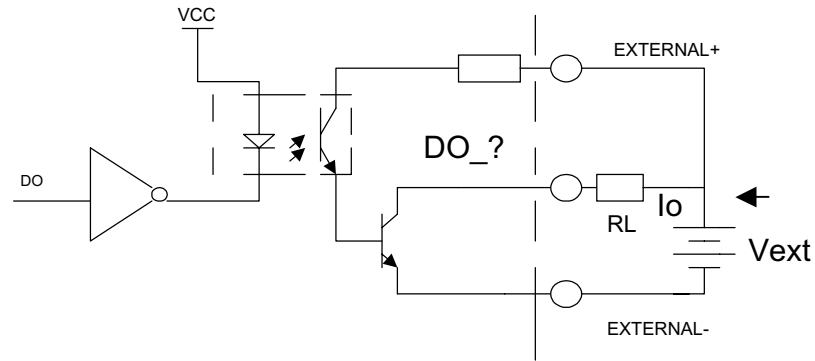
NOTE: NUMBER WILL REPLACE MARK "?".

3.4 Digital Input Circuit (with external power supply)



NOTE: NUMBER WILL REPLACE MARK "?".

3.5 Digital Output Circuit



The sink current calculation is:

$$I_o = \frac{V_{ext} - 0.7}{RL}$$

Where V_{EXT} = external power supply voltage from 5 to 24 VDC
 $V_{CE(sat)}$ = transistor collector-emitter saturation voltage = 0.7v and
 RL = load impedance.

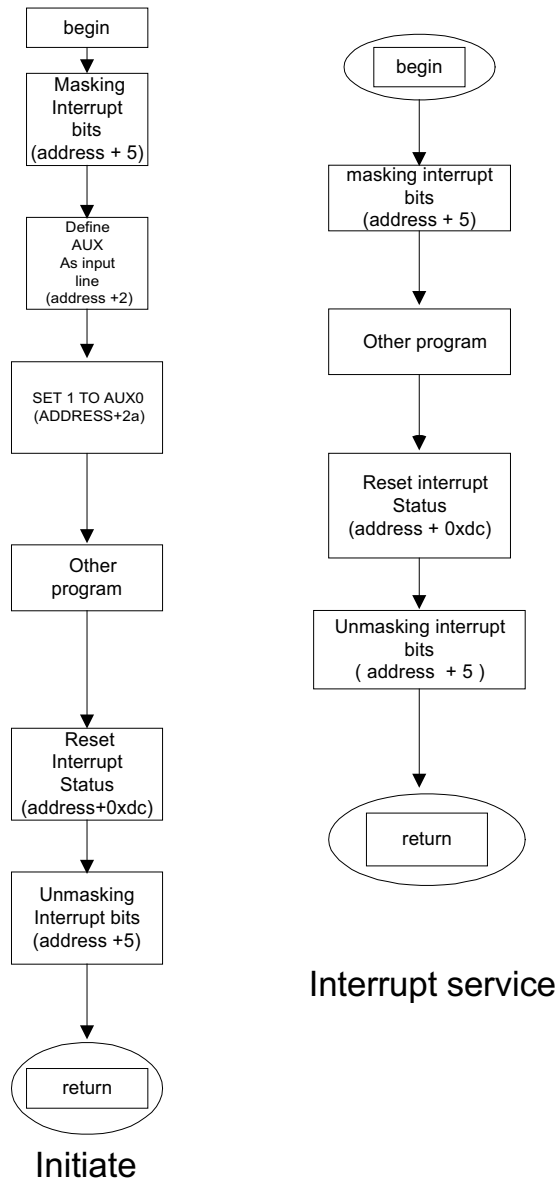
NOTE: The users must also consider the power consumption(p) on RL . NUMBER WILL REPLACE MARK "?".

Where

$$P = \frac{[V_{ext} - 0.7]^2}{RL}$$

$$= I_o RL$$

3.6 Interrupt Diagram



Chapter 4

Device Driver

Device driver is suitable for plug&play in DOS environment to get some information from PCI BIOS.

This section describes in detail on how to install the device driver and use the device driver command to get base address, IRQ level, slot number. Also examples of program are provided only for reference.

After getting their information successfully, you can use the information to act as parameter for driver function described in the next chapter.

All operations within this section will not work unless the device driver 5426DRV.SYS is successfully installed.

How to Install the Device Driver

Before executing any application program (including the following examples), this device driver must be installed. To install the device driver, type:

SETUP [SOURCE DRIVE] [TARGET DRIVE] [DIRECTORY]

This will copy the device driver into your designated directory and then add the following command line to your config.sys:

DEVICE = [PATH] 5426DRV.SYS

Example

If you insert this diskette in driver A: and want to copy the file into c:\AX5426P. You must key in the following command line from the DOS prompt.

A:\>SETUP A: C: AX5426P [ENTER]

And then you must add the following line in your config.sys file.

DEVICE=C:\AX5426P\5426DRV.SYS

Reboot your computer.

If there is any AX5426P plugged in your system, the following message will appear:

```
*****
*           Copyright 1999 by AXIOMTEK Co., Ltd           *
*                                           Ver 1.0          *
*           AX5426P DEVICE DRIVER INSTALLED              *
*****
```

Now AX5426P acts like a file. You can OPEN, CLOSE, WRITE (command), READ(base address, IRQ level, slot number) it via this device driver.

If there is no AX5426P in your system, the following message will appear:

AX5426P or PCI BIOS NOT FOUND!!
Any OPEN to device driver will fail!

Chapter 5

Using the Device Driver Command

The device driver allows user to generate the BASE ADDRESS, IRQ LEVEL, SLOT NUMBER of the AX5426P plugged in your system. Before accessing the device driver, open it as needed. And after accessing the device driver, close it as required.

To get any information (BASE ADDRESS, IRQ LEVEL, and SLOT NUMBER), first of all, you must write a command to the device driver. Then the needed data can be Read from device driver.

There are three commands for user to get base address, IRQ level and slot number. The number following the command indicates card number. To get base address, you must write the command string "B?" to Device driver and then read a word (two bytes) from device driver. This is the base address you need. To get IRQ level, you must write the command string "I?" to device driver and then read a word (two bytes) from device driver. This is the IRQ level you need.

To get a slot number, you must write the command String "S?" to device driver and then read a WORD (two Bytes) from device driver. This is the slot number you need.

NOTE: *The question mark '?' must be replace with card number. If base address return 0, it means all information get by that card number are not available.*

NOTE: *It supports programs written in Microsoft QuickBasic, Microsoft C, Borland Turbo C, and Turbo, Pascal.*

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Chapter 6

Examples

6.1 Turbo C

```
*****
*                               *
*           Example program for turbo C language                       *
*           To get BASE ADDRESS                                         *
*           IRQ LEVEL                                                  *
*           SLOT NUMBER via device driver                              *
*           Before executing this program, device driver                *
*           must be installed successfully.                             *
*****

#include <dos.h>
#include <stdio.h>
#include <string.h>
#include <conio.h>
#include <fcntl.h>
#include <io.h>
main()
{int fd;
  int base,slotno,irqno;
  unsigned int i,j,dat;
  if((fd=open("5426DRV",O_RDWR))==1)
  {
    printf("5426 open fail! \n");
    exit(0);
  }
  else
    printf("ok\n");
  write(fd,"B1",2);
  read(fd,&base,sizeof(int));
  write(fd,"I1",2);
  read(fd,&irqno,sizeof(int));
  write(fd,"S1",2);
  read(fd,&slotno,sizeof(int));
  close(fd);
  printf("BASE ADDRESS: %x\n",base);
  printf("IRQ LEVEL: %x\n",irqno);
  printf("SLOT NUMBER: %x\n",slotno);
}
```

```
if(base==0)
{
    printf("ERROR INFORMATION!\n");
    exit(0);
}
}
```

6.2 Turbo PASCAL

```
*****
*                               *
*       Example program for Turbo PASCAL language                       *
*                               *
*       To get BASE ADDRESS                                             *
*                               *
*       IRQ LEVEL                                                       *
*                               *
*       SLOT NUMBER via device driver                                    *
*                               *
*       Before executing this program, device                           *
*       driver must be installed successfully.                           *
*                               *
*****
```

```
PROGRAM TP_DEMO(input,output);
uses dos,crt;
var
    fdw:text;
    fdr:file of integer;
    addr,irqno,slotno:integer;
begin
    clrscr;
    assign(fdw,'5426DRV');
    assign(fdr,'5426DRV');
    rewrite(fdw);
    writeln(fdw,'b1');
    reset(fdr);
    read(fdr,addr);
    rewrite(fdw);
    writeln(fdw,'i1');
    reset(fdr);
    read(fdr,irqno);
    rewrite(fdw);
    writeln(fdw,'s1');
    reset(fdr);
    read(fdr,slotno);
    close(fdw);
    close(fdr);
    writeln('BASE ADDRESS:',ADDR:10);
```



```
writeln('IRQ NUMBER :',irqno:10);
writeln('SLOT NUMBER :',slotno:10);
if addr <> 0 then writeln('The information
are correct');
end.
```

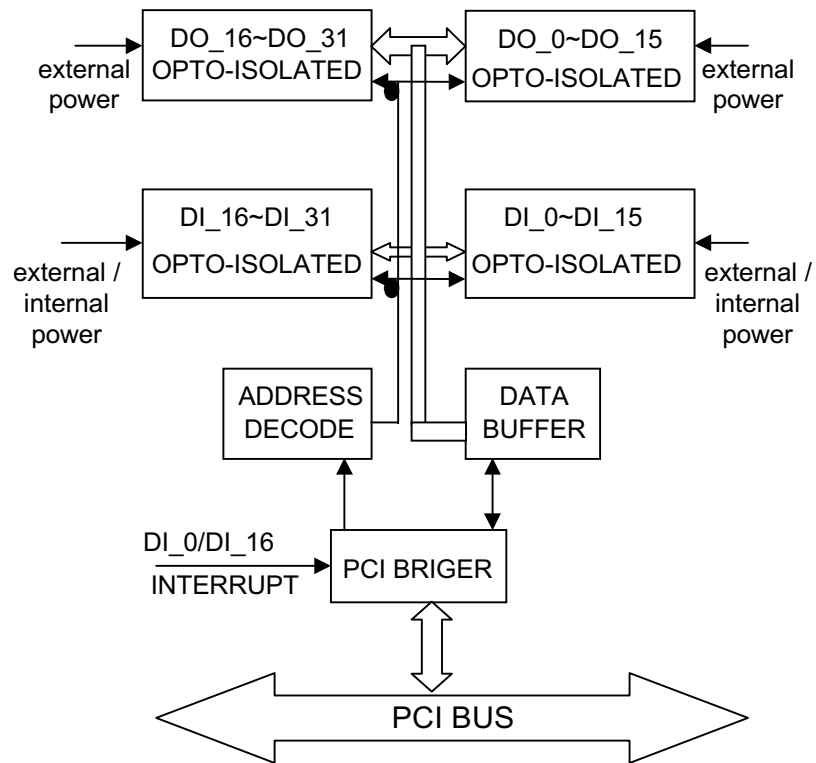
6.3 Qbasic 4.5

```
*****
*                               *
*           Example Program for QB45 language           *
*           To get BASE ADDRESS                         *
*           IRQ LEVEL                                   *
*           SLOT NUMBER via device driver                *
*           Before executing this program, device driver *
*           must be installed successfully. Delete these *
*           note information                             *
*****
OPEN "5426DRV" FOR OUTPUT AS #1
OPEN "5426DRV" FOR BINARY AS #2
PRINT #1,"B1"
GET #2,1,BL%
GET #2,1,BH%
PRINT #1,"I1"
GET #2,,I%
PRINT #1,"S1"
GET #2,,S%
CLOSE #1
CLOSE #2
BL=BL%
BH=BH%
ADDR=BH*256+BL
PRINT "BASE ADDRESS:",ADDR
PRINT "IRQ LEVEL:",I%
PRINT "SLOT NUMBER :",S%
IF ADDR <> 0 THEN PRINT "The information are correct"
```

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Appendix A

Block Diagram



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